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ABSTRACT

Education is moving towards revenue generation from such channels as electronic learning, distance learning and virtual education. Hence learning technology standards are critical to the sector's success. Existing learning technology standards have focused on various topics such as metadata, question and test interoperability and others. However, the metadata standards play an important role in the success of electronic learning. This is due to the fact that metadata is the standard for learning object, which is the main concept that allows interoperability and reusability to occur. Although bodies or consortia such as IEEE LTSC (Learning Technology Standards Committee), IMS (Instructional Management System) and others had developed the metadata standards, there is concern about the features embedded in these standards. To achieve a more meaningful learning process, a learning object needs to comprehend more than technical features. Features such as pedagogic, community and context are important, as they will provide a more far-reaching description of what the learning object is about. The objective of this research is to obtain the detail elements of the metadata standards and enhance it by inserting the necessary elements related to the above features. The learning theories such as Instructional Design Theory, Constructivism Instructional Design Theory and Design Potential Approach were used to derive the elements associated to the above features. The results of this study are in the form of elements that can be embedded into the existing standards. Includes two figures and three tables. (Contains 20 references.) (Author)

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Abstract: Education is moving towards revenue generation from such channels as electronic learning, distance learning and virtual education. Hence learning technology standards are critical to the sector's success. Existing learning technology standards have focused on various topics such as meta-data, question and test interoperability and others. However it is believed that the meta-data standards play an important role in the success of electronic learnin g. This is due to the fact that meta-data is the standard for learning object, which is the main concept that allows interoperability and reusability to occur. Although bodies or consortia such as IEEE LTSC (*Learning Technology Standards Committee*), IMS (*Instructional Management System*) and others had developed the meta-data standards, there is concern about the features embedded in the meta-data standards. It is believed that to achieve a more meaningful learning process, a learning object needs to comprehend more than technical features. Features such as pedagogic, community and context are important, as they will provide a more far-reaching description of what the learning object is about. Thus the objective of the research is to obtain the detail elements of the meta-data standards and enhance it by inserting the necessary elements related to the above features. The learning theories such as Instructional Design Theory, Constructivism Instructional Design Theory and Design Potential Approach were used to derive the elements associated to the above features. The results of this study are in the form of elements, which can be embedded into the existing standards.

Introduction

The key to make e-learning successful is depending in the thriving of learning object design. This is due to the fact that learning object is the core concept of electronic learning where it is regarded as the basic ingredients that allows flexibility, customisation and interoperability to take place. With the use of learning object, recombination of material at any level may occur thus increases the value of the content and facilitates the competency-based learning. The learning object definition abound: *Learning object is any entity, digital, non digital which can be used, reused or referenced during technology supported learning (IEEE Standards, 2000); Learning object is any digital resources that can be reused to support learning (Wiley, 2000)*

We propose the following working definition: *Learning objects are discrete, focused, interactive digital entities, which can be used, reused, searched, referenced to support the learning process.*

Realising the importance of learning object, various consortia such as IMS, IEEE LTSC, ARIADNE (*Alliance Of Remote Instructional Authoring And Distribution Networks For Europe)* and others had made an effort to develop the learning object standards or better known as meta-data standards. The standards derived by these consortia define the conceptual structure for meta-data. Most of these standards provides the technical overview of what learning object should contained and aspects of how meta-data should be structured. For example, IMS defines the conceptual structure for meta-data where it's information model was based on a structure of defined elements that describes or catalogues the learning resource. The model was formed on a

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hierarchy manner and has nine main components, which are (IMS, 2001): general, lifecycle, meta meta-data, technical, educational, rights, relation, annotation, classification. Each of this main component has it's sub-components. For example, the general component has the identifier, title, catalogentry, language, description, keyword and others as it's sub-component. The structure of the meta-data information model is given below (IMS, 2001):

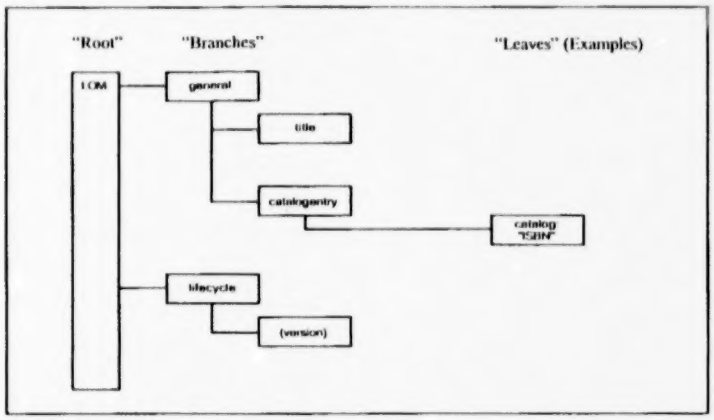

Figure 1: Root to leaf tree view of meta-data

Most of the other standards had similar edifice like the above; although some might have a slight different structure depending on the primary goal of the standards. ARIADNE (2001) for example, is more focused to the educational needs.

Looking at the structure and its sub-elements it is apprehend that the standards are more focused towards the technical aspects of the learning object. Although the standards had put emphasis on the pedagogic portion; where they have the educational and pedagogic elements but little was given. The prominence was more towards describing the interactivity type, intended user role, age range, difficulty level, context, learning time and others. Less emphasis was given on how a learning object may assist effective learning, how it may provide the specific community users and how it may impart the context of instructional use of the object. Apart from that, there is lack of description regarding the learning activities surrounding the learning object and the support for the reuse of the object within specific instructional context (Recker, 2000). These short - comings are the basis that initiates the work.

Current Work.

The work carried out is focusing on how elements such as context, pedagogy and community can be embedded into the learning object standards. Recker (2000), Wiley (2000), Boyle (2001), Suthers (2001), and others had carried out similar work, which shows the importance of having context and pedagogic aspects attached to the meta-data structure. However the details of each element and examples of what can be included into the standards were not given. The aim of the study was to provide details of the elements that need to be attached to the meta-data standards in order to make them more efficient. The work used a comparative approach which involved looking into several learning theories to derive the elements related to context, pedagogy and community. The elements derived are then compared to the existing elements in the standards to see whether the standards had the procured elements. The method carried out in this research is as below (figure 2).

The elements mentioned are believed to be important as without context, learning object is nothing more than a clip art item, it can be misleading, confusing and utterly meaningless (Longmire, 2000). Gillroy (2001) had stated that learning is fundamentally both social and experiential.

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Figure 2: Research Process

Therefore to make learning more pleasurable, the focus should not only be on content but also on the organisation of learning experience. As a result the pedagogical process becomes the most important factor in the design of learning. To have a full understanding on why these elements are believed to be important we need to look at the basis of each element.

Context

Context is a difficult term to explain: basically it means the environment in which the learning unit is situated. It portrays the situation from the learner's point of view. It is an abstract representation of the relevant environment. It then guides adaptive action in that environment, i.e. what type of learning actions to undertake (Boyle, 2000). The context consists of the framing of content along with associated interactivity and it is important in making learning happen within activity rich, interaction rich and culturally rich social environments (Afonso, 2000; Boyle, 2000). Hence in order to construct learning context, it is believed that it will involve content structuring, interactivity, compositional framework and usage of content. As mentioned without context, learning objects can be confusing, misleading or utterly meaningless. Therefore it is important to have context embedded as one of the elements in the learning object.

Pedagogy

Pedagogy means the science of teaching or educating children and is used as a synonym for teaching (Oxford Dictionary, 2002; Wave Technologies, 1996). It is the approach that the teacher/tutor use in constructing the courses to aid cognition through different learning styles. Consequently it embodies teacher focused education. In the pedagogic model, teacher assume responsibility for making decisions about what will be learned, how it will be learned and when it will be learned (Conner, 1996). Pedagogy is important as it shows and directs on what can be learned, how to learn and when to learn. As a result this needs to be included in the learning object as it will help the learners to appreciate the learning process, to be able to use the learning object effectively, to mark the choices of content structuring. With pedagogy embedded in it, it is believed that the learning object can be customised to the individual needs.

Community

A community is a group of individuals who have common values, norms and meanings, a shared history and identifications within a particular culture. The bonds that exist between communities are believed to go

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beyond the instrumental into the realm of affection and exclusive (Gillroy, 2001). Consequently it is significant to have a community feel when using the learning object in order to make the learning process more effective.

Looking at the above facts all the components (context, pedagogy, community) are believed to add value to learning object and it will help to make learning through electronic medium more successful. It would greatly enhanced the educational use of learning objects which are presently pedagogically limited (Cowley, 2000) and context limited (Gillroy, 2000; Boyle, 2000)

Outcome

The learning theories, which were used in the work were the Instructional Design Theory - Dick and Carey Systems Approach Model For Designing Instruction (Dick et al, 2001), The Constructivism Instructional Design (Jonassen, 2001) and the Design Action Potential Approach (Boyle, 1998).The theories were chosen due to the fact that they are the basic theory to the design of instruction in the computer environment and each of them takes a different approach to model the instruction. Dick and Carey ID Theory for instance provide a system approach model for the design, development, implementation and evaluation of instruction. The theory is less complex than the others such as theories by Reigeluth (1999) and Jonassen (1997) to name a few. On the other hand, the Constructivism Instructional Design uses the constructivist conception, which is believed to be the learning theory behind elearning. The Design Action Potential Approach uses an 'action potential' approach distinguishing it from the other theories. It provides a method for formalising scattered knowledge without constraining individual design decisions. Each of these theories was then looked into and analysed and the elements related to the above elements were extracted. Below are the elements extracted.

Context	Pedagogy	Community
1. Types of learner/level 2. Information about the learner	1. Objective of the learning object 2. Factors to motivate learners 3. Required skills needed 4. Language and vocabulary needed	-Nil

Table 1: Dick and Carey Systems Approach Model Elements

Context	Pedagogy	Community
- Nil	1. Presentation of the learning object 2. Structure of the presentation	- Nil

Table 2: Design Action Potential Approach Elements

Context	Pedagogy	Community
1. Types of learner/level 2. Related cases that support understanding of the problem/ access to a set of related experience 3. Problem context 4. Problem representation 5. Problem manipulation 6. Activity done to the learning object	1. A list of objectives 2. Level of complexity of the learning object 3. Pre-requisite requirements 4. Information resources	1.knowledge building communities

Table 3: Constructivism Instructional Design Elements

Each of these elements are then looked into and compared to the existing standards. This is accomplished by giving definition to each elements and examples. The next step taken is by matching up the definition and the examples obtained to the similar sub-elements in the standards. Some of the elements are already existed in the standards but it is believed that it needs further clarification. For example:

Example 1:

Current work: The type of learner element-This element is the classification of the learner. It is to distinguish specific type of learner for a specific type of learning object..Example: beginner/ intermediate/ expert

Existing Standards (IMS, IEEE and ARIADNE): The intended user role element-This element is described as the principal user for which the learning object was design. Example: teacher, author, manager and learner.

It appears that although the same type of element were designed for learners there is different definition to it thus providing different examples. The standard bodies might want to consider another feature, which could be added to the existing standards that might resemble the current work type of learner element.

Example 2:

Current work: Related cases and information resources that support understanding of the problem -This element is the access to a set of experience that the learner can refer to as this will provide the learners with a set of experience to compare *to the current learning object*

Existing Standard (IMS, IEEE and ARIADNE): The existing standards do not embed this element.

Example 3:

Current work Information about the learner-This element is the information about the learner, who may access or use the learning object. It is consider that each learning object has it's target users and the target user's needs to have certain educational levels and prior knowledge before they are able to use the learning object. Thus the learner information must be described in terms of prior knowledge needed and skills required.

Existing standards (IMS, IEEE and ARIADNE): The closest element that can be compared to is the intended user role element. The intended user role element-This element is described as the principal user for which the learning object was design. Example: teacher, author, manager and learner.

From the above examples, it is clearly shown that although the elements might share the same designation; definition differs between them, hence providing different types of examples. It is realised that the definition and the example play a crucial role for each element. This is to provide a clearer picture of the element and allows a thorough comparison to be carried out. Further analysis is also needed for the meta-data standards in order for it to comprehend the pedagogic needs therefore making the learning object more useful and more meaningful to the learners. Apart from that, from the work carried out, it is apprehend that there are more elements, which needs to be added to the meta-data standards. If all of these elements were taken into consideration and be added to the existing standards, learning object will be able to reach it's maximum value; where it does not only make electronic learning a reality but it also allows learning to take place efficiently.

Conclusion

There are more features apart from technical, which needs to be considered when deriving the meta-data standards. Features such as related cases, types of learners, problem manipulation and others need to be considered as to achieve a more comprehensive learning object structure. By adding these elements, which belongs to the context, pedagogy and community elements into the existing standards, it will certainly make the learning object more meaningful to the learners in the future.

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